

TRACKING BURLINGTON'S SUCCESS: A Guide to Collecting, Organizing and Managing Municipal Greenhouse Gas Emissions in Burlington, VT



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Author's Note:

The following guidebook is meant to aid future members of the Burlington Climate Action Planning team in regularly and efficiently tracking municipal greenhouse gas (GHG) emissions produced by city facilities, fleet, services and operational practices. The document is a work in progress, encapsulating lessons learned from previous GHG inventories and anticipating challenges ahead. Therefore, readers are invited to write to the author directly for questions or clarification by emailing Nathaly.AgostoFilion@gmail.com.

The chapters are organized in order to most easily facilitate data entry into Burlington's current GHG accounting tool, Clean Air and Climate Protection Software (CACP 2009). This tool, provided free-of-charge to all members of ICLEI-Local Governments for Sustainability, offers Burlington a way to measure, track and report its GHG emissions as compared to other municipalities of a similar size and character. However, CAP leaders recognize the software has a number of challenges and are exploring alternatives for use into the future. As a result, the author has provided guidance that can be followed regardless of the specific tool selected, based on instructions provided in the Local Government Operations Protocol (LGOP), released in May of 2010. The LGOP was developed and adopted by a consortium of organizations leading the way in the field of local climate action and provides a standardized, rigorous and internationally-recognized approach for quantifying and reporting GHG emissions associated with government operations. As such, this guidebook is meant to encompass the latest in best practices for completing a Burlington municipal GHG emissions inventory.



Climate Action Plan

Burlington Takes Action!

BURLINGTON REDUCTION TARGETS

20% below 2007 levels by 2020

80% below 2007 levels by 2050

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Introduction

The Role of Greenhouse Gases in the Climate Crisis

Greenhouse gases (GHGs) are atmospheric gases, such as water vapor, carbon dioxide, methane, and ozone, which absorb and re-emit the sun's heat, keeping the planet at a livable temperature. However, in recent decades, we've seen the concentration of many of these gases increase substantially above historical and scientific records. Carbon dioxide (CO₂, the second most abundant GHG in the atmosphere) is said to have remained fairly stable at about 275 parts per million for the last 10,000 years until the early 1900s when concentrations began to rise rapidly. Today, the atmospheric concentration of CO₂ is 390 ppm, well above the level it has been since the beginning of human history.

The scientific community has proven the exponential increase in atmospheric CO₂ is a result of humans burning fossil fuels from the Industrial Revolution through today. The scientific consensus is that burning fossil fuels has increased GHGs which have, in turn, affected global temperatures in a phenomenon known commonly as "global warming". The earth's warming has started to melt year-round polar ice and is causing glaciers to retreat resulting in sea level rise across the planet. Continued global warming is also expected to bring about massive changes in the earth's rain cycles, an expansion of deserts, species extinctions and migrations, and shifts in agricultural production.

Tackling Climate Change

Given the disastrous outcomes of global warming, it is surprising that the international discourse has only recently shifted from an atmosphere of doubt and debate to a clear understanding of the need for urgent, decisive action. Despite scientific consensus about the risks associated with unregulated human interference with the climate system, there has been little political will to confront the crisis. The international community is still lacking a global deal for tackling climate change, today.

As a result of the lack of leadership in the international stage, concerned decision-makers at lower levels of society have taken steps to confront climate change within their local jurisdiction. Today, a small amount of countries are competing for the title of first carbon-neutral country, including Costa Rica, the Maldives and New Zealand. At the next geographic size level down, a similar battle is taking place between the Vatican, Kerala (India) among others. Right here in Vermont, climate activists are organizing to demand that the state of Vermont adopt the carbon-neutral goal.

Addressing Climate Change in Burlington, VT

Because our modern lifestyles are so inextricably linked to both the causes and impacts of climate change, many individuals, communities, cities, and select nations have decided to work as best they can to confront global warming by mitigating their GHG emissions and taking actions to adapt to its foreseeable impacts. However, in order to truly tackle climate change at any level, we must first understand how our everyday actions contribute to the problem and what risks we are likely to face as a result of global warming.

In the 1990s, the City of Burlington, Vermont took up this challenge and since then, has been working on climate related activities in varying degrees. In 1996, the City Council voted to participate in the “Cities for Climate Protection” campaign and Mayor Peter Clavelle went on in 1998 to announce a target of reducing emissions by 10% below 1990 levels by the target year of 2005. This goal was set in accordance with guidelines set forth under the 1997 Kyoto Protocol, the international agreement from the United Nations Framework Convention on Climate Change.

Burlington’s early participation in climate work has put it far ahead of municipalities across the world. In 2000, the Burlington Climate Protection Task Force published the City’s first Climate Action Plan offering suggestions for cutting municipal and community carbon emissions across all sectors. In the last decade, however, this report has come to be seen as more of a visioning document than an actionable plan. As such, today’s climate action planning work is focused on showing actual results through measuring performance and managing in response to these.

In 2008, Burlington City staff completed a second inventory using data for the year 2007 leading Mayor Bob Kiss to announce two new goals for local climate action: a short-term goal of 20% GHG emissions reductions below 2007 levels by 2020 and a longer-term goal of 80% reduction by 2050. In order to prove we’re on our way to meeting these goals, there is a clear need for consistent and comparable collection of GHG data for emissions from both municipal operations and from community-wide activities through the establishment of a regular GHG tracking system.

Greenhouse Gas Accounting Standards

As a member of ICLEI-Local Governments for Sustainability, Burlington has been provided with a standardized protocol for use in tracking municipal GHG emissions. This document, known as the Local Government Operations Protocol (LGOP), was published in May of 2010 through collaboration between institutional leaders in climate action. It outlines the process by which city officials should track annual municipal GHG emissions from direct, indirect and fugitive sources using preferred methodology, emissions factors, calculations and assumptions vetted by an international community of scientists, policy experts and climate action practitioners.

Although the community-wide inventory protocol isn’t expected to be released until the fall of 2011, Burlington’s participation in national and international sustainability associations, allows us to design an approach to community emissions tracking that is based on best practices developed by similar team of experts and positions Burlington as a national leader for the coming years during which a national energy policy is expected to be released and as the US engages internationally on setting global emissions reductions targets. It also means, however, that we are living through the evolution of climate action work and will likely experience revisions to data collection tools and procedures.

Using this Guide

This document focuses on the task of accounting for municipal GHG emissions within the geographical boundaries and operational context of the City of Burlington and is meant to guide goal-setting for comprehensive climate action planning. It provides a step-by-step “how-to” guide for City staff and partners to use in collecting GHG emissions data for subsequent re-inventories. This guide should be used in conjunction a toolbox of spreadsheets and other materials that are added as appendices and can

be accessed through the City's electronic file storage (go to S:\Climate Action Plan 2008\Burlington 2010 GHG Inventory). The following pages also outline the standard methodology and assumptions being followed, allowing for comparability with communities similar to Burlington.

This how-to guide is a tool for climate action planning team members to use in the transitional period that has emerged since the publication of the LGOP standard and the point at which it begins to be widely used. It is meant to be easy-to-read, simple and straightforward and is organized through a combination of LGOP-defined sectors and data entry tabs suggested in the City's chosen software tool, the Clean Air and Climate Protection Software of 2009 (CACP 2009). Information and contacts are provided, whenever possible, for the city departments which regularly collect emissions tracking data. The guidebook should be used in conjunction with a set of spreadsheets, which offer additional information on calculation methodologies, assumptions and review the process followed in previous inventories.

Chapter 1. Buildings & Facilities

Given the long winters common in the state of Vermont, heating and energy used in buildings makes up almost half of our state's carbon footprint. In Burlington, heating and powering municipal buildings and facilities accounts for about 20% of the city's greenhouse gas (GHG) emissions (not including the airport). City officials hope to reduce the emissions from our municipal buildings by conserving energy and taking active measures to increase efficiency through weatherizing older buildings and using clean energy technology wherever possible.

Take some time near the beginning of your annual inventory to confirm that you have a complete and up-to-date list of city-owned buildings and facilities. Check with John Vickery in the Assessor's office (for City buildings) and Heather Kendrew (for Airport buildings).

Buildings produce GHG emissions directly (through the on-site combustion of fuel, such as natural gas, for heating) and indirectly (through the purchase of electricity for lighting and power). The Facilities spreadsheet (S:\Climate Action Plan 2008\Burlington 2010 GHG Inventory\Nathaly's Fall 2010 GHG Streamlining Work\FINAL GHG Accounting Tools\FACILITIES.xls) contains a comprehensive list of city-owned buildings and facilities, organized in tabs by the departments which manage them. Take the following steps to gather information on annual fuel combustion, electricity use, and emissions from refrigerants.

Partnering Strategically for City-wide Data:

Purchased Electricity - BED (Scope 2/LGOP pp. 38-48)

- Contact Chris Burns, Director of Energy Services at Burlington Electric Department:
 - Request report on annual electricity use (in kWhs) and cost (in \$) for each facility listed in tracking spreadsheet.

- **2010 INVENTORY ONLY:** Confirm you are getting electricity usage information for ALL structures on each of the 51 City-managed Parcel IDs (for example, North Beach, Cemetery, Wastewater & Water Delivery facilities, City Hall/Firehouse Gallery, etc all have more than one buildings listed under one Parcel ID).

- Update electricity fuel source mix breakdown (by average percentage of grid power, "green" electricity, and biomass in 2010).

On-site Fuel Combustion - VGS (Scope 1/LGOP pp. 30-37)

IF CITY-WIDE DATA GATHERING IS AN OPTION, go ahead with these steps. IF YOU NEED TO CONTINUE DEPARTMENTAL PROCESS (as with '07 data gathering), skip to next page.

- Contact Jeremy King, Building Performance Specialist, or Scott Harrington, Manager of Energy Services at Vermont Gas Systems, Inc.:
 - Request report on annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet.

- **2010 INVENTORY ONLY: Determine which facilities burn other fuel types, if any. Collect data on usage & cost. Update spreadsheet to show future data needs.**

Gathering Departmental Data:

On-site Fuel Combustion - Departmental (Scope 1/LGOP pp. 30-37)

- **2010 INVENTORY ONLY: Determine which facilities burn other fuel types, if any. One option to work with Richard Goodwin of Clerk-Treasurer's Office to generate financial report and identify which facilities pay for a utility account other than BED or VT Gas. Collect data on usage & cost. Update spreadsheet to show future data needs.**
- Burlington Electric Department:
 - Contact Chris Burns, Director of Energy Services at BED for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.
- Burlington Telecom:
 - Contact **NAME** for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.
- City Hall & Firehouse Gallery:
 - Contact **NAME** for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.
- Department of Public Works
 - Contact Pat Buteau, Assistant Director, for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

- **FOR 2010 INVENTORY ONLY: If appropriate, separate facilities containing multiple structures into individual rows on tracking spreadsheet (dependent on how DPW tracks it's fuel usage for facilities..)**

- Fire Department

- Contact Lise Verroneau (Police Department Business Administrator) for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

- Library

- Contact Barbara Shatara, Outreach & Reference Librarian, for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

- Department of Parks and Recreation

- Contact Mari Steinbach, Director, for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

- **FOR 2010 INVEONTRY ONLY: If appropriate, separate facilities containing multiple structures into individual rows on tracking spreadsheet (dependent on how Parks tracks it's fuel usage for facilities..)**

- Burlington Police Department

- Contact Lise Verroneau, Business Administrator for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

- Schools

- Contact Chris Giard, Director of Property Services, or Joel Fitzgerald, Assistance Director for Property Services, for annual combustion of natural gas (in therms) and cost (in \$) for each facility listed in tracking spreadsheet. Gather similar data for other heating fuels used, if applicable.

Chapter 2. Vehicle Fleet

Carbon dioxide emissions from transportation account for the largest percentage of the City's total emissions. In fact, reducing community-wide vehicle miles travelled (VMT) offers the single largest opportunity for decreasing our overall GHG emissions in Burlington. By addressing the carbon footprint of our municipal vehicle fleet, city officials have an opportunity to "walk the walk" and shine an example for steps Burlington residents can take to reduce their VMT.

Be sure to take some time near the beginning of your annual inventory to confirm you have a complete and up-to-date list of city-owned vehicles by checking in with Pat Buteau at DPW.

Most vehicles are powered with fossil fuels, which release CO₂, CH₄, N₂O and other air pollutants as a factor of the internal combustion process. A single gallon of gasoline, itself weighing just over 6 lbs, emits a surprising 20 lbs of CO₂! To track all of the required GHGs, we will need to determine the amount of fuel used, the efficiency of each vehicle (which can be determined by the year, make and model of the car) and annual VMT by said vehicle.

The vehicles spreadsheet (S:\Climate Action Plan 2008\Burlington 2010 GHG Inventory\Nathaly's Fall 2010 GHG Streamlining Work\FINAL GHG Accounting Tools\VEHICLES.xls) contains a comprehensive list of vehicles, organized in tabs by the departments which manage them. Take the following steps to gather information on annual fuel combustion, VMT, and emissions from refrigerants.

- **2010 INVENTORY ONLY: Meet with Rob Green or Pat Buteau to confirm whether current vehicle fleet listing is comprehensive. Update spreadsheet as needed**
 - Ascertain new purchases, vehicles decommissioned, etc
 - Ask specifically about alternative fuel vehicles
 - Figure out if any vehicles are only used seasonally.

Partnering Strategically for City-wide Data:

Mobile Fuel Combustion - DPW (Scope 1/LGOP pp. 64-75)

- Contact Rob Green, Operations Manager, or Pat Buteau Assistant Director at Department of Public Works:
 - Request report on annual fuel consumption (in gallons) and cost (in \$) for each vehicle listed in tracking spreadsheet.

Gathering Departmental Data:

- Airport
 - Contact Heather Kendrew, Airport Engineer, for annual consumption of fuel (in gallons) and cost (in \$) for each vehicle listed in the tracking spreadsheet.
- Schools
 - Contact Chris Giard, Director of Property Services, or Joel Fitzgerald, Assistance Director for Property Services, for annual consumption of fuel (in gallons) and cost (in \$) for each vehicle listed in tracking spreadsheet.
 - Determine which, if any, vehicles operate of a seasonal/temporary basis – note in tracking spreadsheet.

Chapter 3. Employee Commute

As with the municipal vehicle fleet, city officials have an opportunity to practice what they preach by working proactively to reduce the carbon footprint associated with our employee commute. Many alternatives exist for city employees to get to work without burning fossil fuels, such as bike-commuting, taking advantage of public transportation, or even telecommuting one day out of the week. The task at hand demands that the municipality identify structural, institutional, economic and behavioral roadblocks for increasing the use of these alternatives.

To gather data on the number of VMT and emissions associated with employee commute, ICLEI has prepared a survey template (S:\Climate Action Plan 2008\Burlington 2010 GHG Inventory\Nathaly's Fall 2010 GHG Streamlining Work\DRAFT Accounting Tools\Employee Commute) that has been tailored to fit the City of Burlington.

- **2010 INVENTORY ONLY:** Meet with planning team to discuss how to modify the ICLEI survey:
 - Edit to aid continuity with '07 inventory (For example, zip code question was included for potential for applying data to GIS layer, but is not part of ICLEI survey questions.)
 - Consider adding a question about A/C servicing (to reflect potential refrigerant leakage) OR estimating average yearly leakage based on estimated number of cars – in either case, not very good data quality.

Chapter 4. Airport

Burlington is a fairly small city, but having an airport, causes our city's carbon footprint to look very different from other cities our size. In an effort to provide information that is comparable nationwide, airport buildings, facilities and vehicles are analyzed separately from other municipal operations. This also provides city officials with a better grasp of policy alternatives available within this specific and unique department for increasing their sustainability measures.

- Airport (S:\Climate Action Plan 2008\Burlington 2010 GHG Inventory\Nathaly's Fall 2010 GHG Streamlining Work\DRAFT Accounting Tools\AirportFacilities.xls)
 - Contact Heather Kendrew, Airport Engineer, for annual
 - electricity use (in kWhs) and cost (in \$) for each facility under airport management.
 - combustion of natural gas (in therms) and cost (in \$) for each facility under airport management. Gather similar data for other heating fuels used, if applicable.
 - 2010 Team: Work with Heather Kendrew, Burlington Assessor's Office and South Burlington Planning Department to ascertain which airport facilities fall under Burlington operational and reporting boundaries.
 - If appropriate, separate facilities containing multiple structures into individual rows on tracking spreadsheet (dependent on how Airport tracks fuel usage for its facilities.)
 - Decide whether to account for properties being purchased and demolished in GHG Accounting.
 - Determine which, if any, facilities operate on a seasonal/temporary basis – note in tracking spreadsheet.

Chapter 5. Streetlights & Signs; Water, Wastewater & Waste; Power Generation

- Contact Chris Burns, Director of Energy Services at BED to get streetlights and traffic lights electricity consumption information for the entire city.
- Contact Laurie Adams Assistant Director for Water Quality at DPW-Water Division to determine electricity, natural gas, and fuel consumption for each of the Wastewater & Water Delivery facilities throughout the city.
- Contact Jennifer Forguites, Junior Accountant with the Clerk/Treasurer's Office at DPW-Water Division to determine electricity and heating fuel consumption in parking garages across the city.

- 2010 INVENTORY ONLY: figure out how to add McNeill as a power generation facility
 - Decide whether it's worth tracking emissions from the methane gas flare station at the former landfill (going out of commission in the not-too-distant future. look into timeline).

Chapter 6. Other Fugitive Emissions

Another source of GHG emissions are a set of chemicals known as “refrigerants.” These materials, used in refrigerators, chillers, and air conditioning systems, are often overlooked because they are released in very small amounts through leakage or during regular equipment maintenance or servicing. Despite the challenges associated with keeping track of these substances, we need to keep these in mind, as they are powerful greenhouse gases, potentially 10,000 times more potent than CO₂.

On-site Refrigerant Leaks - Departmental (Scope 1/LGOP pp. 56-63)

- 2010 INVENTORY ONLY: Determine which facilities have central air conditioning, large chiller units or non-handheld fire suppression equipment.
 - Determine if refrigerant being used is listed in LGOP Appendix E (Table E.1 or E.2).
- Update Facilities spreadsheet to reflect missing data.
 - Figure out how much of each refrigerant was used (mass balance approach – pp. 56-63)

Mobile Refrigerant Leaks - Departmental (Scope 1/LGOP pp. 75-79)

- 2010 INVENTORY ONLY: Contact Rob Green or Pat Buteau for vehicles maintenance info across all departments. For Schools contact Chris Giard.
- Determine which vehicles have air conditioning.
 - Determine if refrigerant being used is listed in LGOP Appendix E (Table E.1 or E.2).
- Figure out how much was used (mass balance approach – pp. 75-79)